

direction, enhancing the display brightness, and contrast also improves because of reduced back scattering. Because of the high degree of scattering in the layer normal direction, a bright color display can be achieved compared with the liquid crystal display of the third embodiment, though slight image blurring occurs.

Page 61, replace the paragraph beginning on line 4 with the following new paragraph:

The above effect of the anisotropic scattering layer 10 can also be obtained with a TN mode liquid crystal device having a twist angle of about 90°, but the effect of improving the viewing angle characteristic can be further enhanced particularly when the STN mode liquid crystal with a twist angle of 180° to 260° is used.

#### REMARKS

It is not believed any of the amendments introduce new matter. Most are the correction of typographical errors. Their entry is therefore requested.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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Dated: October 31, 2001

By: 

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Application Number: 09/889,852  
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## APPENDIX TO PRELIMINARY AMENDMENT OF OCTOBER 31, 2001

### Version with Markings to Show Changes Made

#### Amendments to the Specification

Page 10, replace the paragraph beginning on line 15 with the following new paragraph:

Figure 4B shows a cross section of the anisotropic scattering layer taken along the Y-axis direction. As in the case of the cross section along the X-axis direction, when a light ray  $L_{iy}$  is incident on the anisotropic scattering layer 10 at an incidence angle  $\theta_y$  relative to the layer normal direction indicated by the dashed line, small fractions of the incident light are back scattered as indicated by  $f_y$  and  $g_y$ , but most of the light is transmitted specularly through the layer. When it emerges from the anisotropic scattering layer 10, the emerging light is forward-scattered in directions  $a_y$ ,  $b_y$ ,  $c_y$ ,  $d_y$ , and  $e_y$  as shown in the diagram. In the Y-axis direction, as in the X-axis direction, the straight-go transmittance is defined as the ratio of the amount of light transmitted specularly in the direction  $c_y$  to the amount of the incident light  $[L_{ix}] \underline{L_{iy}}$ . Likewise, the straight-go transmittance in the layer normal direction is the ratio of the amount of light  $c_y$  when the incident angle  $\theta_y$  is  $0^\circ$ , while the straight-go transmittance in an oblique direction is the ratio of the amount of light  $c_y$  when the incident angle is not  $0^\circ$ .

Page 15, replace the paragraph beginning on line 17 with the following new paragraph:

The transmittance of the first and second electrodes 3 and 4 made of ITO has a significant effect on brightness. The lower the sheet resistance of ITO, the larger the ITO thickness, and the lower the transmittance. In the present embodiment, since data signals are applied to the second electrodes 4, [cross talk is reduced. In the present embodiment,] ITO with a sheet resistance of 100 ohms and a thickness of 0.05  $\mu\text{m}$  is used. Average transmittance is about 92%.

Page 17, replace the paragraph beginning on line 28 with the following new paragraph:

As shown by the curve 31 in Figure 3, the incident angle dependence of the straight-go transmittance along the Y-axis direction is symmetrical about the layer normal direction. In the layer normal direction, the straight-go transmittance is as low as 16%, and the haze value is about 82, that is, the degree of scattering is high. However, in the [X-axis] Y-axis direction, as the incidence angle relative to the layer normal increases, the straight-go transmittance increases symmetrically up to the maximum value of about 24%, and the haze value decreases to about 73.

Page 19, replace the paragraph beginning on line 1 with the following new paragraph:

The [birefringence] reflective index difference  $\Delta n$  of the nematic liquid crystal material 6 used is 0.15, and the cell gap,  $d$ , between the first substrate 1 and the second substrate 2 is set to 5.6  $\mu\text{m}$ . Accordingly, the amount of birefringence,  $\Delta nd$ , of the liquid crystal device 20, given by the product of the [birefringence] reflective index difference  $\Delta n$  of the nematic liquid crystal material 6 and the cell gap  $d$ , is 0.84  $\mu\text{m}$ .

Page 28, replace the paragraph beginning on line 13 with the following new paragraph:

The [birefringence] reflective index difference  $\Delta n$  of the nematic liquid crystal 6 used is 0.131, and the cell gap,  $d$ , between the first substrate 1 and the second substrate 2 is set to 5.8  $\mu\text{m}$ . Accordingly, the amount of birefringence,  $\Delta n d$ , of the liquid crystal device 20, given by the product of the [birefringence] reflective index difference  $\Delta n$  of the nematic liquid crystal material 6 and the cell gap  $d$ , is 0.76  $\mu\text{m}$ . With this alignment, the viewing direction 15 coincides with the direction of 6 o'clock.

Page 42, replace the paragraph beginning on line 2 with the following new paragraph:

The third retardation film 18 is a transparent film about 70  $\mu\text{m}$  in thickness formed by stretching PC, and its phase difference value  $F_3$  is 0.14  $\mu\text{m}$ , i.e., one quarter wavelength, when the wavelength is 0.55  $\mu\text{m}$ . The fourth retardation film 19 is also a transparent film about 70  $\mu\text{m}$  in thickness formed by stretching PC, and its phase difference value [F2] F4 is set to 0.28  $\mu\text{m}$ , i.e., one half wavelength, when the wavelength is 0.55  $\mu\text{m}$ .

Page 42, replace the paragraph beginning on line 25 with the following new paragraph:

The [birefringence] reflective index difference  $\Delta n$  of the nematic liquid crystal 6 used is 0.15, and the cell gap,  $d$ , between the first substrate 1 and the second substrate 2 is set to 5.6  $\mu\text{m}$ . Accordingly, the  $\Delta n d$  value  $R_s$ , representing the birefringence of the liquid crystal device 21 and given by the product of the

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[birefringence] reflective index difference  $\Delta n$  of the nematic liquid crystal 6 and the cell gap  $d$ , is  $0.84 \mu\text{m}$ .

Page 51, replace the paragraph beginning on line 18 with the following new paragraph:

The liquid crystal display configuration having the backlight of the present embodiment can also be applied to any one of the liquid crystal displays of the first to [fifth] fourth embodiments.

Page 52, replace the paragraph beginning on line 17 with the following new paragraph:

As shown in Figure [21]22, the liquid crystal display of the present invention comprises: a liquid crystal device 22; a structure provided above the liquid crystal device 22, consisting essentially of a scattering layer 9, an anisotropic scattering layer 10, a twisted retardation film 12, a first retardation film 13, a second retardation film 14, and a top polarizer 11; and a structure provided under the liquid crystal device 22, consisting essentially of a third retardation film 18, a fourth retardation film 19, a bottom polarizer 17, and a backlight 16. In this embodiment also, the optical compensating element is constructed using three retardation films, i.e., the twisted retardation film 12, the first retardation film 13, and the second retardation film 14. A second optical compensating element is constructed using the third retardation film 18 and the fourth retardation film 19.

Page 53, replace the paragraph beginning on line 3 with the following new paragraph:

The top polarizer 11, the second retardation film 14, the first retardation film 13, the twisted film 12, and the anisotropic scattering layer 10 are laminated together using an acrylic adhesive. The liquid crystal device [21]22 is bonded to the above structure using a scattering adhesive layer formed as the scattering layer 9. The bottom polarizer 17, the fourth retardation film 19, and the third retardation film 18 are laminated together using an acrylic adhesive, and the liquid crystal device 22 is also bonded using an acrylic adhesive.

Page 53, replace the paragraph beginning on line 29 with the following new paragraph:

The transflective layer 25 is formed from a very thin aluminum film which acts as a so-called half-silvered mirror that transmits part of incident light and reflects the remaining part. In the present embodiment, with the aluminum thin film deposited to a thickness of 0.02  $\mu\text{m}$ , the transflective layer 25 transmits about 20% of incident light and reflects the remaining 80%, and is formed in a rectangular shape over the pixel section as shown in Figure [T]23.

Page 54, replace the paragraph beginning on line 16 with the following new paragraph:

The color filter 26 consists of three color filters, i.e., the red, green, and blue filters, and in the present embodiment, the filters are formed in vertical stripe patterns parallel to the second electrodes 4, as shown in Figure [18]23. The width of each color filter is made larger than the width of each second electrode 4 so that no gaps are formed between the filters. If a gap is formed between filters, the amount of incident

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flux will increase, increasing the brightness of the display, but white light will be mixed into the display color and the color purity will degrade, which is not desirable.

Page 56, replace the paragraph beginning on line 3 with the following new paragraph:

Next, the transmissive display mode when the backlight 16 is on will be described. Since neither the transfective layer [9]25 nor the color filter [10]26 exhibits birefringence, the operation of the transmissive display mode is the same as that described in the firth embodiment. That is, light emitted from the backlight 16 is linearly polarized by the bottom polarizer 17, and converted into circularly polarized light by passing through the [third] fourth retardation film 19 and [second] third retardation film 18. The transfective layer [9]25 reflects about 80% of incident light and allows the remaining 20% to pass through it.

Page 58, replace the paragraph beginning on line 25 with the following new paragraph:

The configuration of the liquid crystal display of the present embodiment will be described with reference to the drawing. Figure 24 is a cross-sectional view for explaining the component elements of the liquid crystal display of the eighth embodiment according to the present invention. The configuration of the pixel section is the same as that shown in the enlarged view of Figure 23, and the relative orientations of the various component elements are the same as those shown in Figures 19 and 20 and will not be described here in detail. The configuration of the liquid crystal display of the present invention will be described below with reference to Figures [18, 23,] 23, 24, 19, and 20.

Page 59, replace the paragraph beginning on line 1 with the following new paragraph:

As shown in Figure 24, the liquid crystal display of the present invention comprises: a liquid crystal device 22; a structure provided above the liquid crystal device 22, consisting essentially of an anisotropic scattering layer 10, a twisted retardation film 12, a first retardation film 13, a second retardation film 14, and a top polarizer 11; and a structure provided under the liquid crystal device 22, consisting essentially of a third retardation film 18, a fourth retardation film 19, a bottom polarizer 17, and a backlight 16. In this embodiment also, the optical compensating element is constructed using three retardation films, i.e., the twisted retardation film 12, the first retardation film 13, and the second retardation film 14, and the material having the characteristic shown by the curve 34 or 35 in Figures [1]5 and [5]6 is used for the anisotropic scattering layer. The second optical compensating element is constructed using the third retardation film 18 and the fourth retardation film 19.

Page 60, replace the paragraph beginning on line 27 with the following new paragraph:

Color display can be achieved by combining the ON/OFF states of display pixels; further, with the provision of the anisotropic scattering layer [10a]10, light rays incident at angles of 20° to 50°, which are most frequently encountered in an ordinary use environment, can be intensely reflected in the layer normal direction, i.e., the viewing direction, enhancing the display brightness, and contrast also improves because of reduced back scattering. Because of the high degree of scattering in the layer normal

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direction, a bright color display can be achieved compared with the liquid crystal display of the third embodiment, though slight image blurring occurs.

Page 61, replace the paragraph beginning on line 4 with the following new paragraph:

The above effect of the anisotropic scattering layer [10a]10 can also be obtained with a TN mode liquid crystal device having a twist angle of about 90°, but the effect of improving the viewing angle characteristic can be further enhanced particularly when the STN mode liquid crystal with a twist angle of 180° to 260° is used.

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